ENVIRONMENTAL PROTECTION AGENCY

Special Folder

Llangollen Landfill

May 4, 1976

Larry S. Miller, Chief
Water Quality Monitoring Office, S&A (3SA60)

ORIGINAL (Red)

James F. Manwaring, Chief
Water Supply Branch (3WP30)

Attached are the long awaited for results on the Llangollen Landfill. Unfortunately, they probably will not help you much in attempting to define the extent of the problem.

I suggest if you need more specific information that you request S&A to investigate the problem and collect additional samples for analyses. It appears to me that a different sampling technique should be used to further concentrate the pollutants in the sample.

Attachments
a/s

CONCURRENCES

AR-100172

SYMBOL							
SURNAME							
DATE							

EPA FORM 1320-1

OFFICIAL FILE COPY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Samples from Llangollen Landfill DATE: April 28, 1976

FROM: James W. Marks
Laboratory Chief

TO: Larry Miller

ORIGINAL
(Red)

THRU: Orteris Villa, Jr.
Director

The enclosed report from James Barren describes our findings on samples from the Llangollen Landfill. The samples are described as follows:

AES Sample No.	Location
76021217	Mobil Oil Co. Production Well #3
76021218	American Water Co. Llangollen Field Well #7
76021219	County Operated Recovery Well #6
76021220	County Operated Recovery Well #3

As stated by Mr. Barren, there are no detectable organic compounds in the samples received. A much lower detection limit could be obtained by taking a much larger sample and using the XAD resins for concentration. If this would be desirable, I would suggest a 5 gallon sample at each location.

I discussed this situation with Greg on Tuesday, April 27. I asked him to find out just what organic compounds were expected and whether it would be advisable to resample.

James W. Marks
Laboratory Chief

JWM/jr

AR100173

EPA Form 1320 (Rev. 6-72)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

SUBJECT: Samples from Llangollen Landfill, Del. DATE: April 27, 1976

FROM: James Barron

TO: James W. Marks
Laboratory Chief

ORIGINAL
(Red)

Three liters of each sample were extracted according to EPA procedures for GC-MS analysis of organics. In addition, an aliquot was taken for odor tests according to Odor (Sec. 136) Standard Methods using undiluted samples. The only odor that could be detected was a natural humic, phenolic type of odor of decaying plant material. No strong chemical odors were noted.

Examination of the samples by GC-MS at a sensitivity level of 10ppb Phenol produced no detectable organics. Mass searches at the parent ions of all the simple phenols and chlorinated phenols produced no peaks.

We have recently started utilizing the more efficient XAD resins as a means of trapping organics from large volumes of water. This allows us to utilize larger sample volumes.

We would like to re-sample this location utilizing this procedure to insure, if there are problem organic compounds present, they will be obtained at detectable levels.

Analyst:

James Barron

JB/jr

AR100174

EPA Form 1320-6 (Rev. 6-72)

ENVIRONMENTAL PROTECTION AGENCY

Llangollen Landfill - Water Sample Analysis

February 23, 1976

Larry S. Miller, Chief
Water Quality Monitoring Office, S&A (3SA60)

Orterio Villa, Director
Annapolis Field Office (3SA20)

ORIGINAL
(Red)

Please handle this request as soon as possible.

Attachment

AR100175

CONCURRENCES

SYMBOL ▶							
SURNAME ▶							
DATE ▶							

EPA FORM 1320-1

OFFICIAL FILE COPY

ROUTING AND TRANSMITTAL SLIP

TO (Name, office symbol or location)		ACTION
1 Gary	INITIALS	CIRCULATE
	DATE	COORDINATION
2	INITIALS	FILE
	DATE	INFORMATION
3	INITIALS	NOTE AND RETURN
	DATE	PER CON-VERSATION
4	INITIALS	SEE ME
	DATE	SIGNATURE

REMARKS

ORIGINAL (Red)

F.Y.I.

Water Supply is involved

We are analyzing a few samples for them in A.F.O.

Pls return for our files.

Do NOT use this form as a RECORD of approvals, concurrences, disapprovals, clearances, and similar actions

AR100176

FROM (Name, office symbol or location): Larry

DATE: 4/8

PHONE

OPTIONAL FORM 41
AUGUST 1967
GSA FPMR (41 CFR) 100-11.206

5041-101

INTERDIVISION ROUTE SLIP

DATE: 4/2/76

TO:	INFO	ACTION
3SA00 Director		
3SA00 Deputy Director		
3SA10 Wheeling Field Office		
3SA20 Annapolis Field Office		
3SA30 Environmental Emergency Br		
3SA40 Air Quality Monitoring Br		
3SA60 Water Quality Monitoring Ofc	✓	
Other:		

Action Completed By: _____

Prepare for signature of _____

Return for file

Circulate Larry - I don't know how this reached Ralph or for what purpose. I keep hearing about the problem, but really know nothing of the Region's involvement.

Gary AR100177

FROM: OFFICE OF THE DIRECTOR
SURVEILLANCE & ANALYSIS DIVISION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region III – 6th & Walnut Sts.
Philadelphia, Pa. 19106

SUBJECT: Llangollen Landfill - Water Sample Analysis DATE: February 18, 1976

FROM: Charles L. Kleeman, Staff Engineer
Water Supply Branch (3WP31) Chas. L. Kleeman

ORIGINAL (Red)

TO: Larry S. Miller
Water Quality Monitoring Office (3SA60)

On Thursday, February 12, 1976, I collected four water samples from wells in the immediate vicinity of the Llangollen landfill, New Castle County, Delaware. I then personally delivered them to James W. Marks at the EPA laboratory in Annapolis for GC/MS organic analysis. Please accept this memo as a formal request from the Water Supply Branch, for the above mentioned analyses.

We have not supplied a deadline date for the work, but we would appreciate response as soon as possible. Jim Marks suggested that the analysis could begin on or about March 1, and I indicated that this date would be acceptable.

The sampling and organic analysis was recommended by Chris Little, headquarters council, in anticipation of a possible enforcement action under the Emergency Powers section of PL 93-523. A possible imminent hazard exists as the groundwater being withdrawn for drinking water in the nearby Amoco Chemical Corp. and private homes is believed to be contaminated with organic leachate from the Llangollen landfill.

AR100178

EPA-III-013-73-T

S. Vasuki

MEMORANDUM

TO: M. C. Vasuki DATE: March 10, 1976

THRU: John Egan
Mike Apgar

FROM: Andrew A. Liu
Ron Stoufer

ORIGINAL
(Red)

SUBJECT: Report on statistical analysis of groundwater quality data from the vicinity of Llangollen landfill

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At a meeting concerning changing the Llangollen sampling program in Mr. Vasuki's office on February 19, 1976, a suggestion was made that before any changes are made in the sampling program, we should determine what the data are telling us so far. Mike Apgar showed data plots drawn by the Water Supply Group which demonstrated that the water quality indicators are showing considerable variation and a few showed apparent trends whereas trends in others were difficult or impossible to see. Since the data are quite variable, Mr. Vasuki and others felt that a statistical analysis of the data should be done to determine objectively what significant trends exist in the quality of the groundwater and to evaluate whether the groundwater quality near the landfill is getting better, getting worse, or whether it has stabilized. This memo is a report of the results of the statistical analysis. It will not attempt to give a hydrologic interpretation of the results.

METHODS

Mike Apgar specified the wells to be included in the analysis including a supply well for both Amoco and Artesian Water Company, the leachate recovery wells, some monitor wells in key locations between the landfill and

Amoco's and Arteriam's wells and Army Creek at a point downstream from the landfill and the contaminant recovery discharges to the stream. ORIGINAL (red)

Mike Apgar selected the chemical parameters to be analyzed. CO_2, Cl, NH_3-N, Fe, and TOC were chosen because they are gross indicators of landfill contamination, and pH was also analyzed because of its influence on metals concentrations.

Andy Liu designed the statistical analysis methods. Mr. Vasuki originally suggested that a time-series analysis be done. However, that method could not be applied to the data available because the time interval between samples is often not equal. In fact, from a single sampling station, the sampling interval may range from daily to weekly to monthly to quarterly. After studying the available data, Andy developed a method applicable to it.

For each sampling station, each sampling date was assigned a day number, with the first sample being day 1, a sample collected 7 days later being day 8 and so on so that the day number represented the number of days since sampling began at that locality. The concentration of one of the chemical parameters (e.g. Cl) was "plotted" (in the calculator) on the y axis versus the day number on the x axis. In this way, all the available data for that parameter were "plotted" versus the day number for each sample. The object was to determine if a continuing trend was indicated. Therefore, the best straight line was fit to the points by the method of least squares. Then the hypothesis that this straight line has zero slope was tested. If the slope was statistically significantly different than zero, then a significant trend was indicated, a positive slope meaning an increasing trend and a negative slope meaning a decreasing trend. This process was repeated for all the parameters for each well.

ORIGINAL (Red)

Whether the slope of the regression line was statistically significantly different than zero was determined by applying a t-test. A t was calculated by

$$t = \frac{\text{slope}}{\text{standard error of estimate}}.$$

The standard error of estimate reflects both the variation in the data and the number of samples. If the calculated t exceeded the critical value of t (in a table) required to show that the probability of achieving the calculated t by chance was less than 1%, then we said that the trend was significant at the 99% confidence level.

From visual inspection of the data plot graphs, it was apparent that some of the wells (especially recovery wells) had very poor quality water when they were first pumped in late 1973. During continued pumping, the groundwater quality rapidly improved into mid-1974 when it seemed to level off. If all of the data is used for such a well and a straight line is drawn, a sharp decreasing trend will be indicated. However, this trend was strongly influenced by the rapid improvement in the first few months of pumping and is not representative of the quality trends within the last year which are of the greatest importance for our consideration of what is happening to the groundwater quality at the landfill now. Therefore, if a trend (either increasing or decreasing) was indicated by analyzing all the data, the method was repeated using only data collected since July 1974.

RESULTS

Table 1 is a tabulation of the results obtained from the statistical analysis. Slopes which were not significantly different from zero are denoted "NSC" (for no significant change). When a significant trend was

indicated, its slope is given. The slope is an indicator of the rate of change in mg/l/day. The slope was multiplied by 365 days/yr to obtain the rate of change per year that is listed. It must be noted that exploding a daily rate to a yearly one multiplies any error in the daily figure but a yearly rate is more useful for interpretation.

ORIGINAL (Red)

The trends must be put into content to answer such questions as, "Is the groundwater quality still bad even though it is getting better?" Therefore, from the equation for the least squares regression line, a concentration for each parameter at each sampling station was projected for February 29, 1976 and is tabulated in Table 1. Because of the variability in the data, this projection is an approximation. It is a better approximation when a lot of data is available, a poorer approximation when less data are on hand. Extreme data values may pull the regression line up or down especially when the number of samples is small. Although the projections are approximations, they do seem useful to obtain an estimate of a representative concentration that is not confused by wondering if the data value is just a temporarily high or low one.

Tables 2 and 3 are summaries of the trends. Table 2 shows trends apparent when all the data is used and Table 3 shows the trends determined from the data collected since July 1, 1974.

Figures 1, 2, 3, and 4 are intended to give a spatial view of the trends and projected concentrations. Figure 5 shows the locations where some arbitrary water quality limits are exceeded by the projected concentrations.

cc: Mr. Charles J'Anthony
Mr. Jay [illegible]
Dr. Harry [illegible]

TABLE 1
SUPPLY WELLS

Well # AWC 7

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD	[illegible]	-	NSC		37
pH	[illegible]		NSC		5.9
Cl	[illegible]		NSC		23
NH_3-N	[illegible]		NSC		.1
Fe	[illegible]		NSC		.5
TOC	1		--		--

Dates Covered _____ to _____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD				
pH				
Cl				
NH_3-N				
Fe				
TOC				

Well # PW 3

Dates Covered 2-7-74 to 1-7-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD	19		NSC		1.6
pH	19		NSC		6.3
Cl	19		NSC		25.0
NH_3-N	19		NSC		0.2
Fe	19	-.0015	95%	-.5	1.6
TOC	1		--		--

Dates Covered _____ to _____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD				
pH				
Cl				
NH_3-N				
Fe	16		NSC	
TOC				

RECOVERY WELLS

Well # RW-1

Dates Covered 5-22-73 to 1-13-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
	49		NSC		19
	48		NSC		6.7
	48		NSC		46
	48		NSC		7.1
	49		NSC		5.3
	13	-.2619	95%	-95	0

Dates Covered ____ to ____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Pr. Co. Pe.
COD					
pH					
Cl					
NH_3-N					
Fe					
TOC					

Well # RW-2

Dates Covered 7-2-75 to 1-7-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
	43		NSC		28
	43		NSC		-6.6
	43		NSC		44
	43		NSC		2.6
	41	+.0205	99%	+7.5	16.3
	7		NSC		0

Dates Covered ____ to ____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Pr. Co. Pe.
COD					
pH					
Cl					
NH_3-N					
Fe					
TOC					

Well # RW-3

Dates Covered 7-5-73 to 1-20-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	61	-.0831	99%	-30	9.4
[illegible]	40		NSC		6.6
[illegible]	[illegible]	[illegible]	99%	-15	29
[illegible]	[illegible]	-.0098	99%	-1.6	.09
[illegible]	61	-.0075	99%	-17	0
[illegible]	18		NSC		18

Dates Covered 7-11-74 to [illegible]

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD	62		NSC	
pH	57		NSC	
Cl	58	-.0578	99%	-1.7
NH_3-N	56	-.0056	99%	-2.0
Fe	58		NSC	
TOC	16	-.2114	95%	-77

Well # RW-4

Dates Covered 7-16-73 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	61	-.1063	99%	-53	0
[illegible]	[illegible]		NSC		6.8
[illegible]	[illegible]		NSC		31
[illegible]-N	[illegible]	-.0634	95%	-.51	1.2
[illegible]	61	-.0327	99%	-12	0
[illegible]	17		NSC		27

Dates Covered 7-11-74 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD	52		NSC	
pH				
Cl				
NH_3-N	52	-.0050	99%	-1.8
Fe	52	-.0109	99%	-4.0
TOC				

Well # RW-5

Dates Covered 7-2-75 to 1-20-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-20-76
[illegible]	30	+.6578	95%	+58	103
	30		NSC		6.7
	30		NSC		129
[illegible]-N	30	+.0757	99%	+6.4	18
	30		NSC		13
[illegible]	16		NSC		19

Dates Covered ____ to ____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	P C
COD					
pH					
Cl					
NH_3-N					
Fe					
TOC					

Well # RW-6

Dates Covered 8-6-75 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-20-76
[illegible]	30		NST		28
	30		NST		6.7
	25	-.1188	99%	-43	17
-N	27	-.0096	99%	-3.5	5.8
	28	-.0073	95%	-2.7	17.6
	17	-.2078	99%	-76	0

Dates Covered ____ to ____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	P C
COD					
pH					
Cl					
NH_3-N					
Fe					
TOC					

AR100186

ORIGINAL (Red)

Well # 27

Dates Covered	4-9-73		to 6-26-75		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	88	•	NSC		58
[illegible]	89	+.0018	99%	+.29	7.2
[illegible]	89		NSC		125
[illegible]-N	74		NSC		6.7
[illegible]	86		NSC		15.8
[illegible]	19		NSC		49

Dates Covered	7-11-74		to [illegible]		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	
COD					
pH	33		NSC		
Cl					
NH_3-N					
Fe		-			
TOC					

Well # 28

Dates Covered	3-[illegible]-73		to 1-27-76		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	100		NSC		80
[illegible]	92	+.0001	95%	+.04	6.8
[illegible]	99		NSC		208
[illegible]-N	89	+.0146	9[illegible]%	+5.3	38
[illegible]	9[illegible]	+.0123	99%	+4.5	33
[illegible]	1[illegible]		NSC		33

Dates Covered	7-11-74		to [illegible]		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	
COD					
pH	49		NSC		
Cl		-			
NH_3-N	48		NSC		
Fe	48	+.0251	99%	+0.7	
TOC					

Well # 29

Dates Covered 5-9-73 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
D	98	-.0957	99%	-35	24
	91		NSC		6.8
	97	-.1117	99%	-41	162
)-N	93		NSC		48
	97		NSC		36
	18	-.0306	99%	-11	12

Dates Covered 7-11-74 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD	44	-.0852	99%		
pH					
Cl	43	-.3038	99%	-1.1	
NH_3-N					
Fe					
TOC	9	-.1838	99%	-.7	

AR 60188

Well # 31

Dates Covered 8-29-73 to 7-29-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
	56		NSC		26
	57		NSC		76.9
	97	+.0681	95%	+16	130
	96	-.0191	99%	-7.0	13
	55	-.0159	99%	-5.8	4.1
	2				

Dates Covered ____ to ____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD					
pH					
Cl	9		NSC		
NH_3-N	9		NSC		
Fe	9		NSC		
TOC					

Well # 53

Parameter	Dates Covered	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	3-7-73 to 1-27-76	43	-.1518	95%	-55	40
		[illegible]		NSC		5.5
		42	-.1059	90%	-37	28
[illegible]-N		42	-.0080	90%	-2.9	1.6
		43		NSC		38
[illegible]		37	-.2178	99%	-79	0

Parameter	Dates Covered	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD	____ to ____				
pH					
Cl					
NH_3-N					
Fe					
TOC					

MONITORING WELLS
Well # 22

Parameter	Dates Covered	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	3-29-73 to 1-7-76	[illegible]		NSC		12
		[illegible]	+.0002	95%	+.29	7.0
		[illegible]		NSC		25
[illegible]-N		[illegible]		NSC		.7
		21	-.0028	95%	-1.0	5.4
		[illegible]				

Parameter	Dates Covered	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD	____ to ____				
pH		15		NSC	
Cl					
NH_3-N					
Fe		15		NSC	
TOC					

AR 10018

ORIGINAL (Red)

Well # 82

Dates Covered	6-19-73	to	12-2-75		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-28-76
COD	2[illegible]	-	NSC		37
pH	2[illegible]	-.0065	95%	-.18	6.8
Cl	2[illegible]		NSC		97
NH_3-N	2[illegible]		NSC		.7
Fe	2[illegible]	+.0036	99%	+3.1	12.1
TOC	--		--		

Dates Covered	7-1-74	to	12-[illegible]-[illegible]		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	
COD					
pH	18	-.0009	99%	-.[illegible]	
Cl					
NH_3-N					
Fe	18	+.0134	99%	+[illegible].[illegible]	
TOC					

Well # 85

Dates Covered	3-7-74	to	1-7-76		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-28-76
COD	15		NSC		36
pH	18		NSC		6.9
Cl	18		NSC		13
NH_3-N	17	-.0011	99%	-.40	0
Fe	18	-.0181	99%	-5.1	0
TOC	8		NSC		5

Dates Covered		to		
Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD				
pH				
Cl				
NH_3-N				
Fe				
TOC				

Well # 59

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	21	+.1686	95%	+62	140
[illegible]	21		NSC		6.8
[illegible]	21		NSC		37
[illegible]-N	21	-.0016	99%	-.5	.1
[illegible]	21	-.0006	95%	-.2	.3
[illegible]	--		--		--

Dates Covered 7-3-75 to [illegible]

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD	17		NSC	
pH				
Cl				
NH_3-N	17	-.0016	99%	-.5
Fe	17		NSC	
TOC				

Well # 61

Dates Covered 3-3-75 to 1-5-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
[illegible]	11		NSC		56
[illegible]	11		NSC		6.8
[illegible]	11	-.1758	99%	-58	3
[illegible]-N	11		NSC		.3
[illegible]	11		NSC		8.8
[illegible]	11		NSC		0

Dates Covered [illegible] to [illegible]

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)
COD				
pH				
Cl				
NH_3-N				
Fe				
TOC				

ARMY CREEK

Dates Covered 8-21-73 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
	89	-.0005	95%	-15	22
	90	-.0023	95%	-.1	7.0
	7	-.0550	90%	-20	63
	90	-.0060	95%	-2.2	4.6
	44		NSC		2.9
	47		NSC		13
	77	-.0105	91%	-3.8	1.7

Dates Covered 7-11-74 to 1-27-76

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD	88		NSC		
pH	88		NSC		
Cl	87	-.0678	95%		
NH_3-N	87	-.0128	95%	-4.7	
Fe					
TOC					
BOD	87		NSC		

Dates Covered _____ to _____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76

Dates Covered _____ to _____

Parameter	No. of Anal.	Slope of Regr. Line	Signi-ficance	Rate of Change per yr. (mg/l/yr)	Projected Conc. 2-29-76
COD					
pH					
Cl					
NH_3-N					
Fe					
TOC					

AR100192

ORIGINAL (Red)

↗ statistically slight - most interesting trend,
↘ significant increasing trend,
NSC = no statistically significant change

Recovery Wells	COD	pH	Cl	NH_3-N	Fe	TOC	BOD
RW 1	NSC	NSC	NSC	NSC	NSC	↘	
RW 2	NSC	NSC	NSC	NSC	↗	NSC	
RW 3	↘	NSC	↘	↘	↘	NSC	
RW 4	↘	NSC	NSC	↘	↘	NSC	
RW 5	↗	NSC	NSC	↗	NSC	NSC	
RW 6	NSC	NSC	↘	↘	↘	↘	
27	NSC	↗	NSC	NSC	NSC	NSC	
28	NSC	↗	NSC	↗	↗	NSC	
29	↘	NSC	↘	NSC	NSC	↘	
31	NSC	NSC	↗	↘	↘	--	
53	↘	NSC	↘	↘	NSC	↘	
Monitor Wells	COD	pH	Cl	NH_3-N	Fe	TOC	BOD
22	NSC	↗	NSC	NSC	↘	--	
42	NSC	↘	NSC	NSC	↗	--	
45	NSC	NSC	NSC	↘	↘	NSC	
49	↗	NSC	NSC	↘	↘	--	
61	NSC	NSC	↘	NSC	NSC	NSC	
Supply Wells	COD	pH	Cl	NH_3-N	Fe	TOC	BOD
PW-3	NSC	NSC	NSC	NSC	↘	NSC	
AWS-7	NSC	NSC	NSC	NSC	NSC	NSC	
Seneca	COD	pH	Cl	NH_3-N	Fe	TOC	BOD
Army Creek	↘	↘	↘	↘	NSC	NSC	↘

ORIGINAL (Red)

AR100193

[illegible]

[illegible] TREND ANALYSIS

[illegible] DATA FOR SINCE APPROXIMATELY JULY 1974

ORIGINAL (Red)

↗ statistically significant increasing trend,

↘ significant decreasing trend,

NSC-no statistically-significant change

	COD	pH	Cl	NH3-N	Fe	TOC	BOD
Recovery Wells							
RW 1	NSC	NSC	NSC	NSC	NSC	↘	
RW 2	NSC	NSC	NSC	NSC	↗	NSC	
RW 3	NSC	NSC	↘	↘	NSC	↘	
RW 4	NSC	NSC	NSC	↘	↘	NSC	
RW 5	↗	NSC	NSC	↗	NSC	NSC	
RW 6	NSC	NSC	↘	↘	↘	↘	
27	NSC	NSC	NSC	NSC	NSC	NSC	
28	NSC	NSC	NSC	NSC	↗	NSC	
29	↘	NSC	↘	NSC	NSC	↘	
31	NSC	NSC	NSC	NSC	NSC	--	
53	↘	NSC	↘	↘	NSC	↘	
Monitor Wells							
22	NSC	NSC	NSC	NSC	NSC	--	
42	NSC	↘	NSC	NSC	↗	--	
45	NSC	NSC	NSC	↘	↘	NSC	
49	NSC	NSC	NSC	↘	NSC	--	
61	NSC	NSC	↘	NSC	NSC	NSC	
Supply Wells							
PW-3	NSC	NSC	NSC	NSC	NSC	NSC	
PW-4	NSC	NSC	NSC	NSC	NSC	NSC	
Seeps							
[illegible]	NSC	NSC	↘	↘	NSC	[illegible]	

AR100194

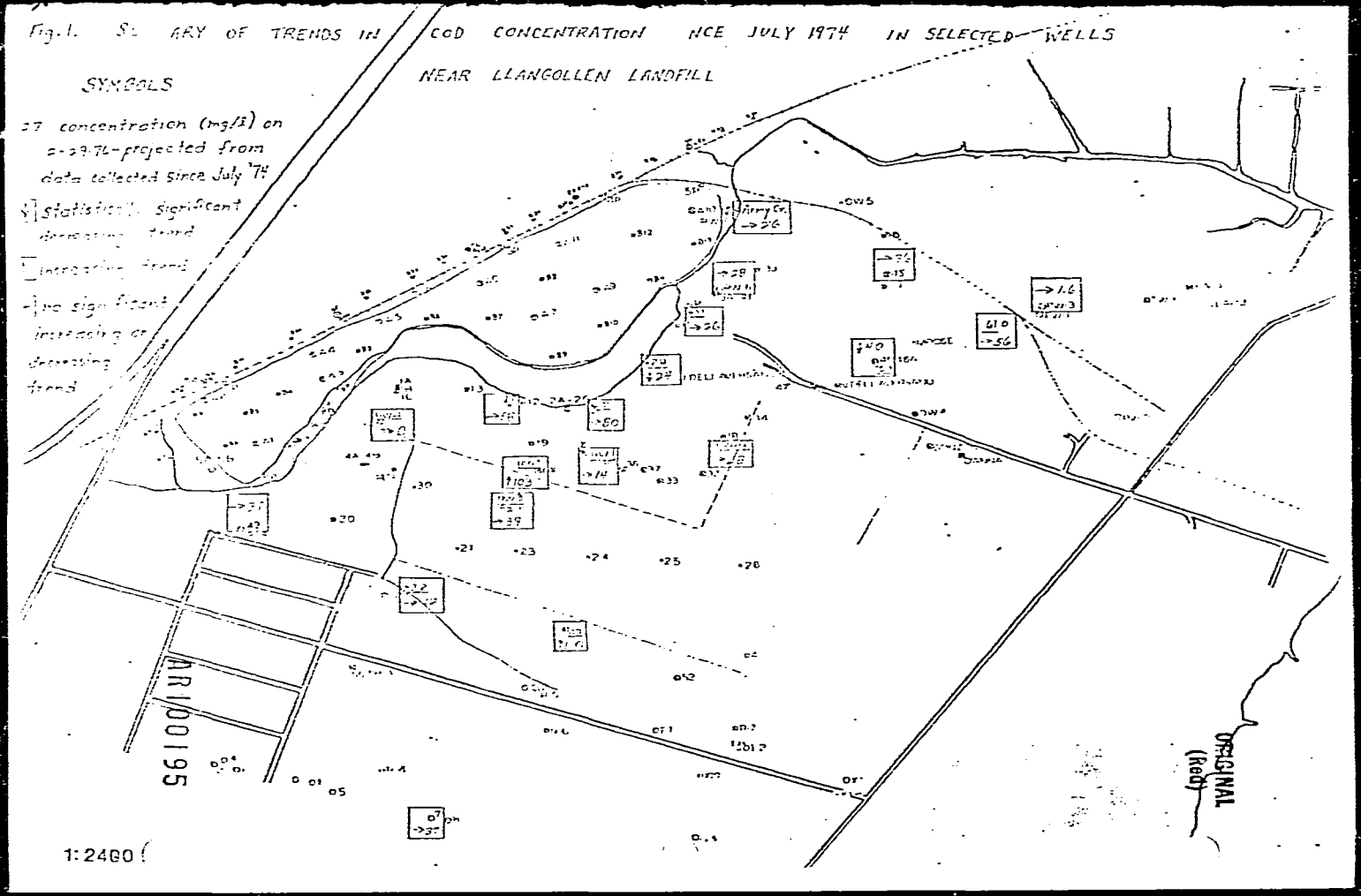
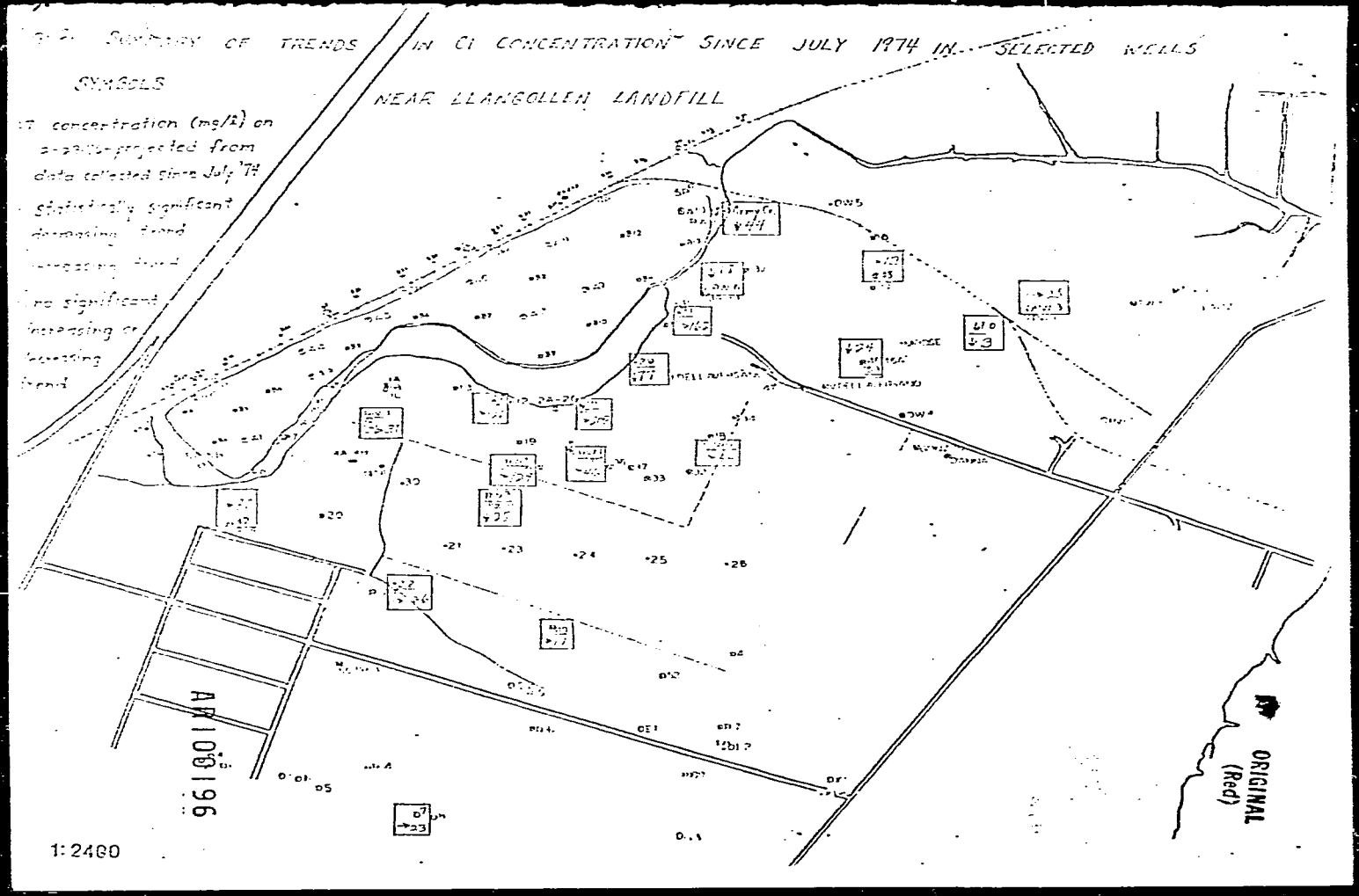
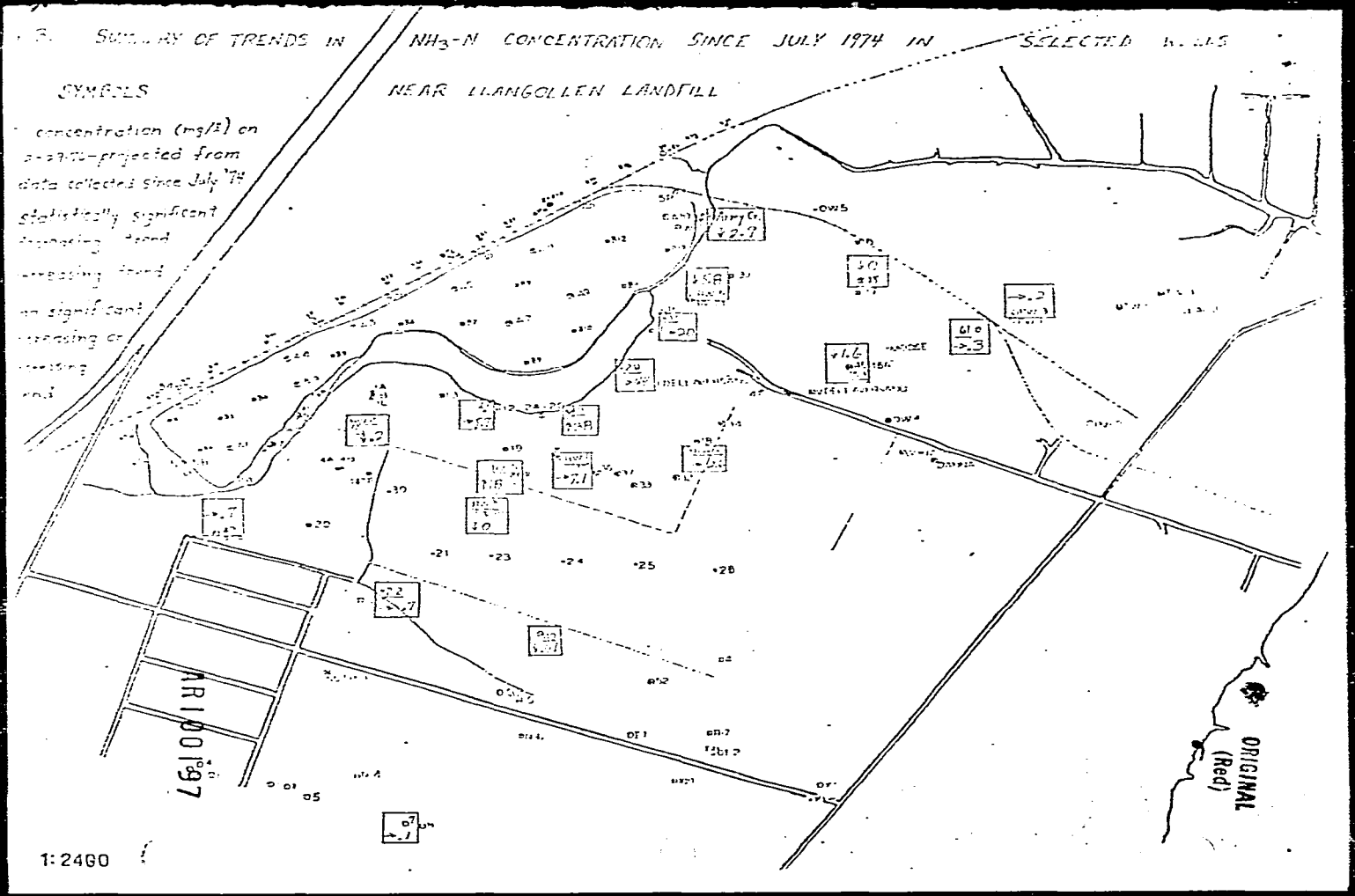
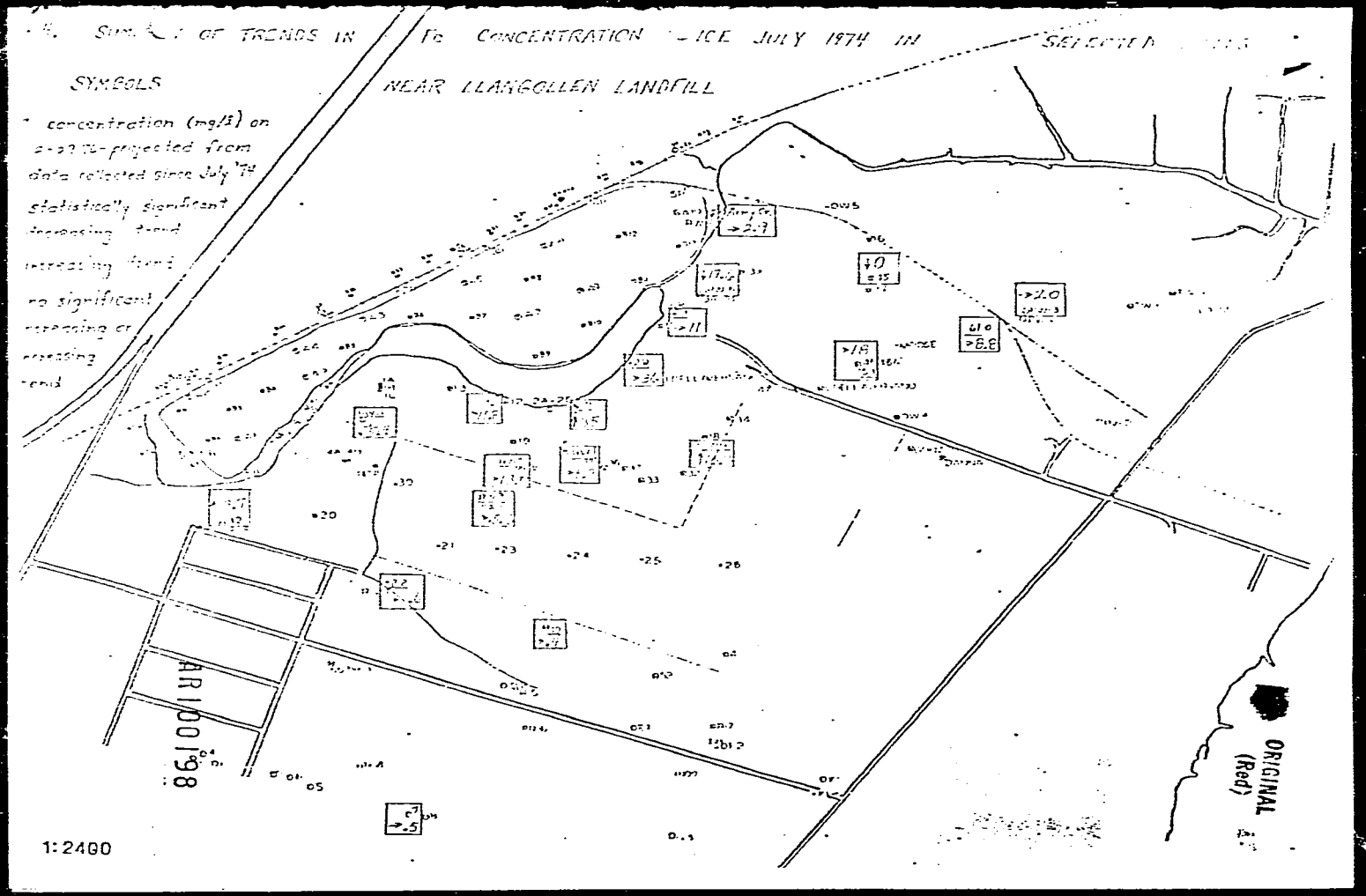
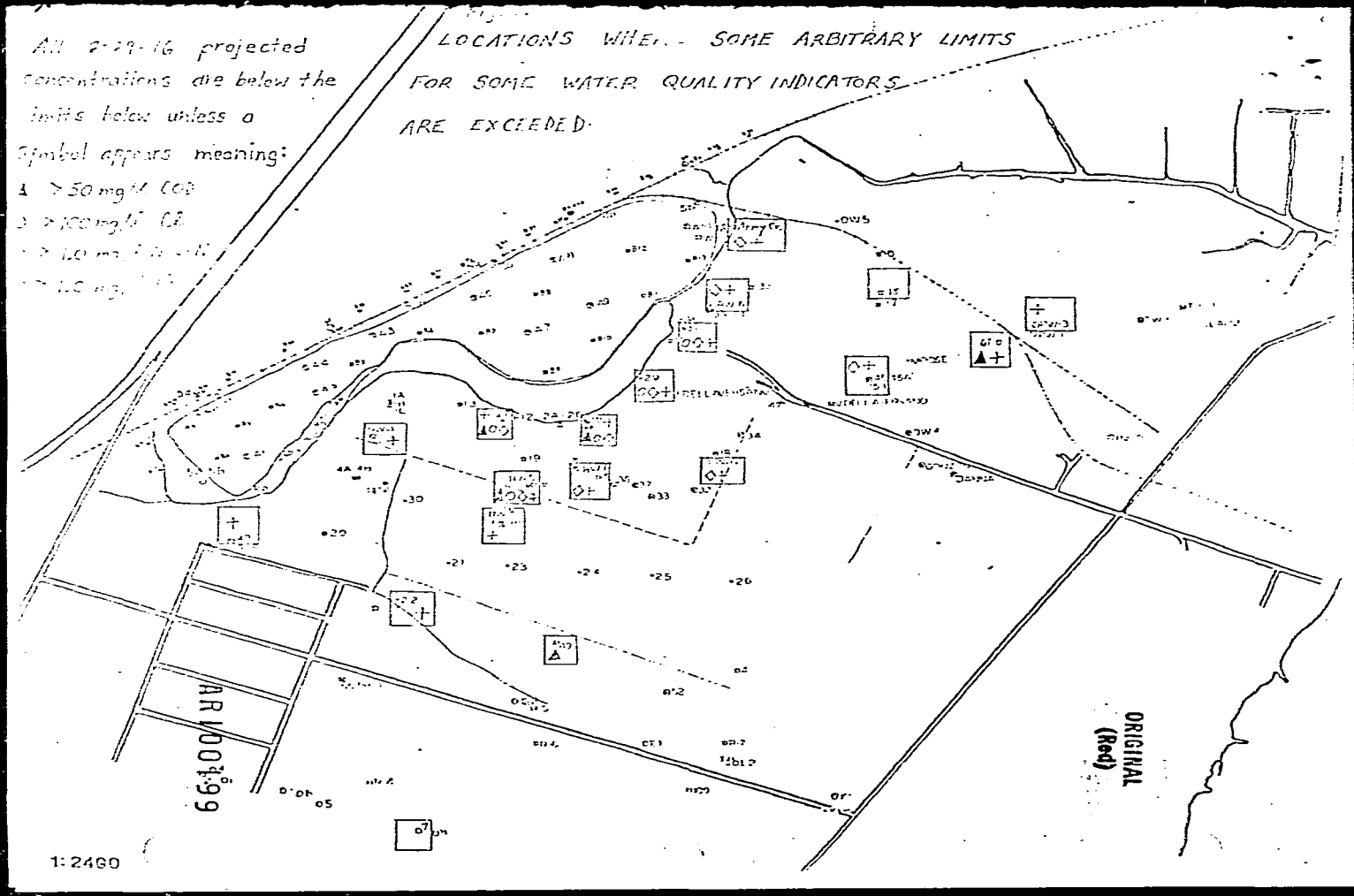


Fig. 1. SUMMARY OF TRENDS IN COD CONCENTRATION SINCE JULY 1974 IN SELECTED WELLS NEAR LLANGOLLEN LANDFILL
SYMBOLS
27 concentration (mg/l) on a-29-74 projected from data collected since July '74
statistically significant decreasing trend
statistically significant increasing trend
no significant increasing or decreasing trend
ARIO195
ORIGINAL (red)
1:2400


SUMMARY OF TRENDS IN Cl CONCENTRATION SINCE JULY 1974 IN SELECTED WELLS
NEAR LLANGOLLEN LANDFILL
SYMBOLS
Cl concentration (mg/l) on
a graph projected from
data collected since July '74
statistically significant
decreasing trend
increasing trend
no significant
increasing or
decreasing
trend
ORIGINAL
(Red)
1:2400


3. SUMMARY OF TRENDS IN NH3-N CONCENTRATION SINCE JULY 1974 IN SELECTED WELLS NEAR LLANGOLLEN LANDFILL
SYMBOLS
concentration (mg/l) on a-axis-projected from data collected since July '74
statistically significant decreasing trend
increasing trend
no signif cant increasing or decreasing trend
ORIGINAL (Red)
1:2400


SYMBOLS
NEAR LLANGOLLEN LANDFILL
1:2400
ORIGINAL (Red)


All 2-29-16 projected concentrations are below the limits below unless a symbol appears meaning:
1 > 50 mg/l COD
2 > 100 mg/l Cl
LOCATIONS WHERE SOME ARBITRARY LIMITS FOR SOME WATER QUALITY INDICATORS ARE EXCEEDED.
ORIGINAL (Red)
1:2400